Hemisphere GPS®

IntelliFlow

User Guide

Part No. 875-0180-000 Rev. C1

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

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Hemisphere GPS Precision GPS Applications

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6,111,549	6,397,147	6,469,663	6,501,346	6,539,303
6,549,091	6,631,916	6,711,501	6,744,404	6,865,465
6,876,920	7,142,956	7,162,348	7,277,792	7,292,185
7,292,186	7,373,231	7,400,956	7,400,294	7,388,539
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Chapter 1: Introducing IntelliFlow

What's Included

The new Air IntelliFlow® Dual Rate option enables you to spray variable rate jobs in less time and in fewer trips. It does this by enabling you to spray two applications at the same time.

The basic IntelliFlow allows you to spray a constant rate *or* a variable rate job.

The optional IntelliFlow Dual Rate enables you to:

- Spray a constant rate and a variable rate job simultaneously.
- Maintain droplet size when spraying constant Ultra Low Volume (ULV) rates.
- Mix two different applications at the end of the spray nozzle on the same swath.
- Spray one rate for most of a field and another rate for "spot" spraying where the crop is in need of special treatment to increase the yield.
- Switch back and forth between variable rate and constant rate jobs as needed.

The Hemisphere GPS flow control solution has proven to be rugged, efficient, reliable, and most importantly, flexible. The IntelliFlow Dual Rate option allows you to interface to any valve size and monitor a wide range of turbine flows. Because you are operating two controllers, you can independently operate two control valves and two spray-off relays, while monitoring two flow turbines.

Using the Hemisphere GPS IntelliFlow system is easy. Upload your prescription maps using MapStar® and select them from the M3's cockpit display. Alternatively, you can enter your own flow control parameters.

Figure 1-1: IntelliFlow meter, valve, and controller. Optional IntelliFlow Dual Rate meter, valve, and controller not pictured.

What's Included

Below is the parts list for the IntelliFlow system. Please check your parts to make sure you have everything before beginning installation.

Item	Part Number	Qty
IntelliFlow Controller	806-1020-000	1
Spray-Off Relay	900-3040-000	1
Valve/Motor Assembly (2")	806-1025-000	1
Meter (2")	806-1025-000	1
Cable (IntelliFlow - M3, AUX, Flow Meter, Spray-Off Relay)	051-0163-222	1
Cable (IntelliFlow - Flying Flagman, AUX, Flow Meter, Spray-Off Relay)	051-0204-222	1
Cable (IntelliFlow - Motor/Valve)	054-0110-222	1
User Guide	875-0180-000	1

Item	Part Number	Qty
IntelliFlow Controller	806-1020-000	2
Spray-Off Relay	900-3040-000	2
Valve and Motor Assembly (2”)	806-1025-000	1
**Valve and Motor Assembly (1/2”)	710-0060-000	1
*Valve and Motor Assembly (1”)	806-1032-000	1
Flow Meter (2”)	900-3026-000	1
**Flow Meter (1/2”)	750-0046-000	1
*Flow Meter (3/4”)	710-0059-000	1
**Cable (Ultra-Low Volume Adaptor)	051-0173-000	1
Cable (IntelliFlow Dual Rate - M3, AUX, Flow Meter, Spray-Off Relay)	051-0170-000	1
Cable (IntelliFlow - Motor/Valve)	054-0110-222	2
Cable (IntelliFlow - Power)	054-0101-000	2
Pressure Switch, Aircraft	075-0035-222	2
10 Amp Circuit Breaker	424-0004-222	2
User Guide	875-0180-000	1

Notes:
*Available with 1” Intelliflow Dual Rate Kit.
**Available with 1/2” Ultra-Low Volume Intelliflow Dual Rate Kit.

Chapter 2: Installing IntelliFlow

Important Safety Considerations

Planning the Installation

Mounting the Components

Connecting the Cables (M3)

Connecting the Cables (Flying Flagman)

Connecting the Spray-Off Relay and Power

Calibrating the Pressure Switch (Optional)

Important Safety Considerations

Warning! Please read all installation instructions and warnings BEFORE beginning the installation. **FAILURE TO DO SO MAY CAUSE IRREVERSIBLE DAMAGE TO YOUR SYSTEM.**

For trouble-free operation and maintenance of your IntelliFlow system, please adhere to the following recommendations.

1. Avoid using the IntelliFlow system in environmental conditions above or below the specified operating temperatures.
2. When flying under adverse conditions, cover the motor head with a water-resistant canvas to avoid water and/or chemicals from seeping into the controller or motor.
3. Wash the hopper/boom system thoroughly and methodically after spray sessions to avoid gumming up the flow turbine unit.

Warning! If you do not maintain your system and find the flow turbine unit gummed up, you may have to remove the unit and clean it on the bench. This requires disassembling the unit and reassembling it.

4. When using highly corrosive products, protect the valve stem by lubricating it with a few drops of pneumatic turbine lubricating oil or, if not available, low-viscosity lubricating oil every 20 to 30 hours of spray time. This will avoid gumming and/or chemical corrosion buildup around valve stem and/or gland sealing components.

Tip! Apply penetrating oil, if required. Use products such as WD-40 or any quality penetrating oil before lubricating.

5. Do not tighten the valve stem gland-retaining nut unless you know how it is sealed. Any incorrect adjustment to the tension of the gland-retaining nut can adversely change the torque required to rotate the valve stem. This will cause the motor valve transmission and/or motor to over work, possibly causing damage.

Warning! If the valve stem starts to gum-up, the motor valve will not be able to respond to the IntelliFlow commands correctly. A tight valve stem can cause excessive current through the power IC chip inside the IntelliFlow controller.

Planning the Installation

To install the IntelliFlow system:

- mount the flow control components,
- connect the cables,
- connect the spray-off relay and power, and
- calibrate the pressure switch (optional).

Required Tools

Installing IntelliFlow requires the following tools:

- electric drill and 3/16” and 5/32” drill bits
- hacksaw
- thread sealant to prevent leakage
- hose or flange clamps (12)
- support straps (1 - 2). A stainless wrap-around strap and supporting piece is recommended.

Required Power Supply

IntelliFlow requires an 11 - 32 Volt power supply.

Warning! Power connections must be properly grounded. See Figure 2-5 on page 16 for recommended ground points.

Mounting the Components

Install the following components before connecting the cables:

- the IntelliFlow controller
- the spray-off relay
- the flow meter and motor/valve assembly
- the power and run/dump switches

Installing the IntelliFlow Controller

Install the controller in an available space on the aircraft. For example, in a compartment above the boom.

Note: If using IntelliFlow Dual Rate, you will install a second controller. See Chapter 3 for details.

To install the controller

1. Use the controller to mark your mounting location.
2. Use a 3/16″ drill bit to drill the mounting holes.
3. Mount the controller to the aircraft using #10-32 fasteners.

Installing the Spray-Off Relay

Mount the spray-off relay next to the controller.

To install the spray-off relay.

1. Use the relay to mark your mounting locations.
2. Use a 5/32″ drill bit to drill the mounting holes.
3. Use 2 #8-32 screws to mount the relay to the aircraft.

Installing the Flow Meter and Valve Assembly

Install the flow meter and motor/valve assembly in the existing boom supply tube on the aircraft. The figure below shows the recommended configuration of IntelliFlow's flow meter and motor/valve assembly.

Other configurations are possible, but see the Caution note on the next page.

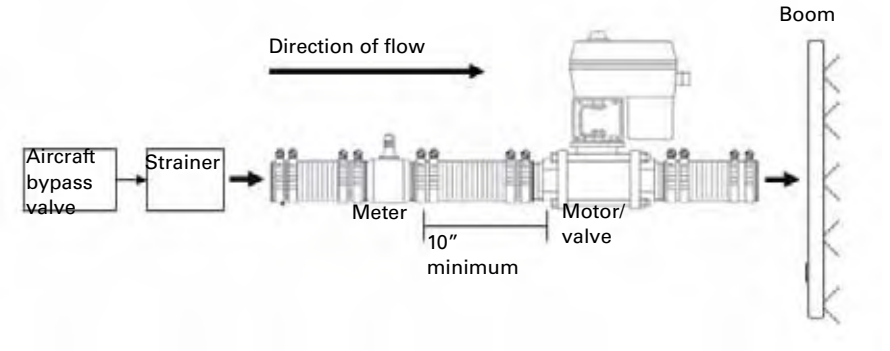


Figure 2-1: IntelliFlow meter and motor/valve assembly.

Note: If using IntelliFlow Dual Rate, you will install a second flow meter and motor/valve assembly next to the first one. See Chapter 3 for details.

Caution! Install the flow meter before the valve to avoid turbulence around the flow meter.

If you cannot install the units in the recommended configuration due to physical limitations in your aircraft, you may invert the units. To reduce turbulence, maintain the following minimum hose length-to-diameter ratios:

- hose between strainer and flow meter (10:1)
- hose between flow meter and motor/valve assembly (5:1)

To install the flow meter and motor/valve

1. Measure and cut the hoses needed to connect the strainer to the flow meter, the flow meter to the motor/valve assembly, and the motor/valve assembly to the boom.
2. Connect the hoses using hose clamps. Use two clamps at each connection point (refer to Figure 2-1.).

Warning! Place the meter at least 10” from the valve to minimize turbulence around the flow meter. See the Caution note above.

3. Attach the IntelliFlow assembly to the boom supply plumbing.

Note: The completed IntelliFlow assembly will be installed in the middle of your boom supply tube.

4. Install one or two support fittings from the belly of the aircraft close to the valve and flow meter.

Warning! Do not connect fittings directly to the valve or meter. Use a stainless wrap-around strap and supporting piece.

Installing the Power and Run/Dump Switches

Install the Power and Run/Dump switches so that they are accessible to the pilot while flying.

Note: You may need to disassemble the wires on the switches to place the switches in the panel depending on the desired assembly and drilling locations.

To install the switches.

1. Install the switches in the instrument panel in the cockpit.
2. Connect the switch circuit breaker to the master bus. See Figure 2-5 on page 16.

Connecting the Cables (M3)

Use the following diagram to connect the cables to the flow control components, M3, and power supply. A detailed diagram of the relay kit installation needed for variable rate is shown on the next page.

Warning! Avoid shorts to the ground which will damage the IntelliFlow control unit and/or motor control unit. Check the grounding cable and lugs.

Do not coil or pinch cables. This will introduce noise into the system and/or destroy the cable.

Secure all cables to avoid the effects of excessive vibration.

Do not place stress on the cable connectors.

Store excess cable length with a minimum 6-inch bend radius.

Avoid high-temperature exposure (exhaust, manifold, etc.) when routing cables.

Avoid running cables where they will interfere with normal operation of the aircraft.

Avoid placing cables close to sources of interference.

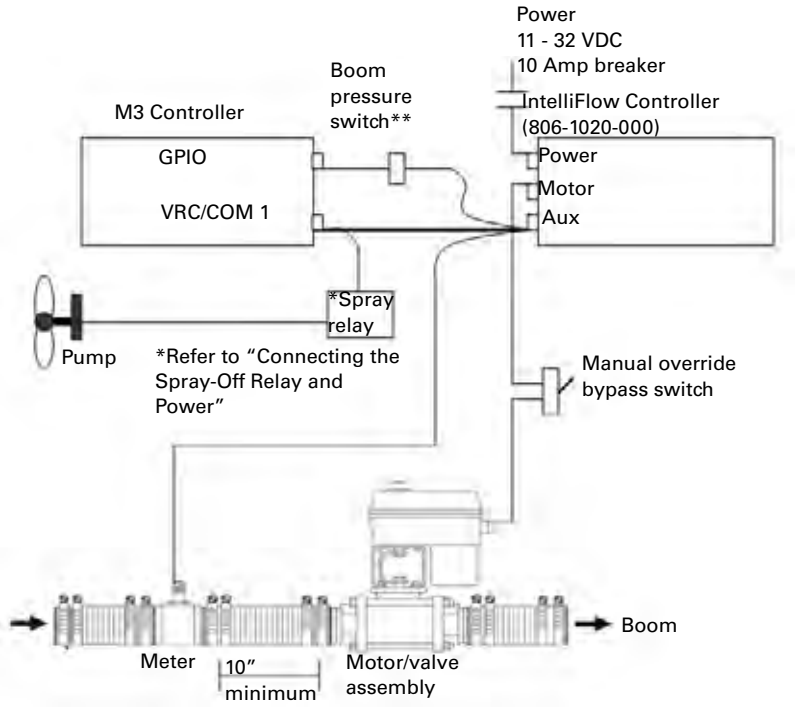


Figure 2-2: IntelliFlow-M3 cable connections.

Note: Cable connection details for the spray-off relay and power are detailed in Figure 2-5 on page 16.

** See Figure 2-3 on page 13 for the Boom Pressure Switch wiring details.

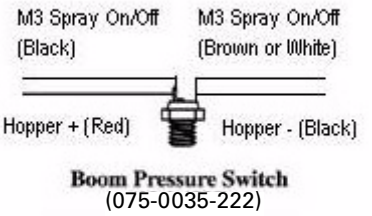


Figure 2-3: Boom Pressure Switch Setup

Connecting the Cables (Flying Flagman)

Use the following diagram to connect the cables to the flow control components, Flying Flagman, and power supply.

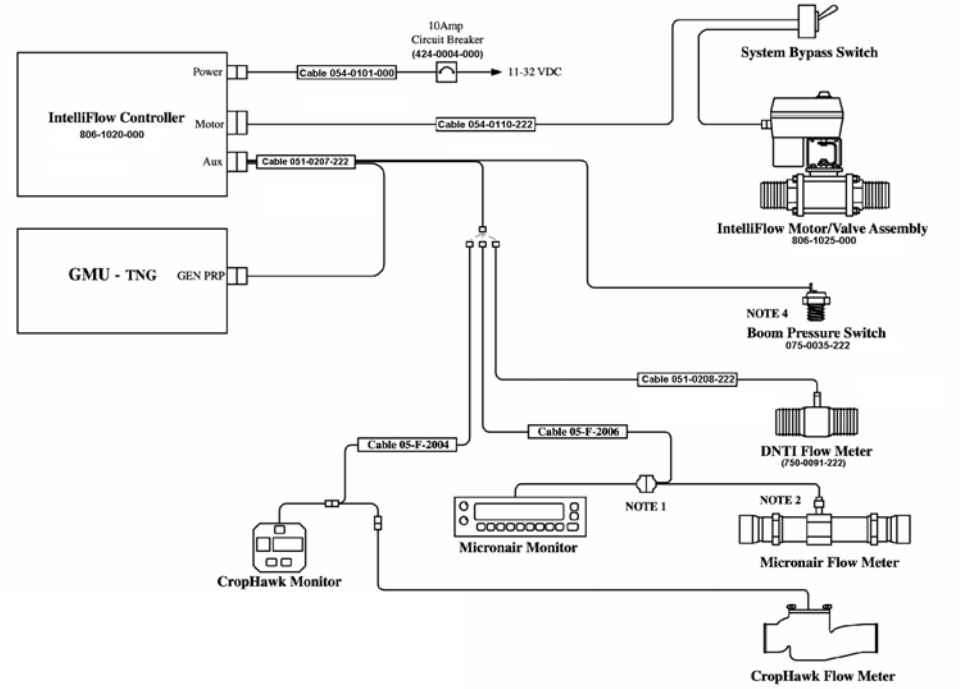


Figure 2-4: *IntelliFlow-Flying Flagman cable connections.

Warning! •Avoid shorts to the ground which will damage the IntelliFlow control unit and/or motor control unit. Check the grounding cable and lugs.

- Do not coil or pinch cables. This will introduce noise into the system and/or destroy the cable.
- Secure all cables to avoid the effects of excessive vibration.
- Do not place stress on the cable connectors.
- Store excess cable length with a minimum 6-inch bend radius.
- Avoid high-temperature exposure (exhaust, manifold, etc.) when routing cables.
- Avoid running cables where they will interfere with normal operation of the aircraft.
- Avoid placing cables close to sources of interference.

Notes:

Connections for Cable 05-F-2006:
Red wire - Pin 11 of DB25 connector
Black wire - Pin 12 of DB25 connector

Do not connect cable shield to anything.

The Micronair flow meter can be used without the Micronair monitor. Use Cable 051-0208-222 in this case.

The system bypass switch, part number 075-3019-222, comes with Cable 054-0110-222.

Set the pressure switch to operate between 12 and 15 psi.

Connecting the Spray-Off Relay and Power

Use the following diagram to connect the spray-off relay and power.

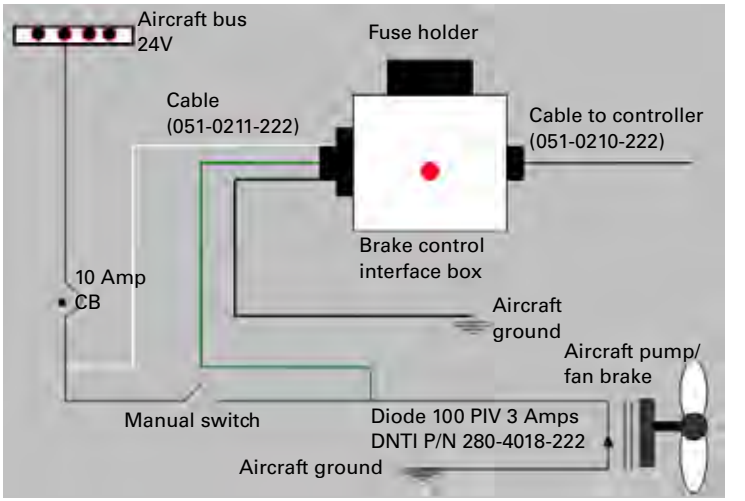


Figure 2-5: Spray-off relay and power connections.

Note: The individual wires for Cable 051-0211-222 are 15’ long.

Calibrating the Pressure Switch (Optional)

Use the following formula to calibrate the pressure switch, if using one.

Switch Pressure = 50% of Minimum Spray Boom Pressure

For example, if the minimum boom spray pressure is 20 pounds, adjust the pressure switch to 10 pounds.

To calibrate the pressure switch

1. Remove upper rubber stop on the pressure switch.
2. Adjust the Allen screw head inside the top of the switch.
3. Use a multi-meter or low voltage (1.5 D.C.) bulb to indicate when switch contacts are closed.

Note: The switch is N/O (Normally Open); The contacts will close when the required pressure is correct.

Chapter 3: Installing IntelliFlow Dual Rate

Mounting the Components

Connecting the Cables

To install the IntelliFlow Dual Rate system, follow the installation instructions for IntelliFlow in Chapter 2 with the following exceptions:

- Mount a second controller and a second flow meter and motor/valve assembly.
- Follow the instructions for connecting the cables for the IntelliFlow Dual Rate in this section.

It is very important that you follow the instructions listed in Chapter 2 under:

- Important Safety Considerations
- Planning the Installation

Mounting the Components

The IntelliFlow Dual Rate system uses a second controller and a second flow meter and motor/valve assembly.

Follow the instructions in Chapter 2 to mount the second set of components.

Connecting the Cables

Use the following diagram to connect the cables to the flow control components, M3, and power supply. A detailed diagram of the relay kit installation needed for variable rate is shown in “Installing IntelliFlow” in Figure 2-5 on page 16.

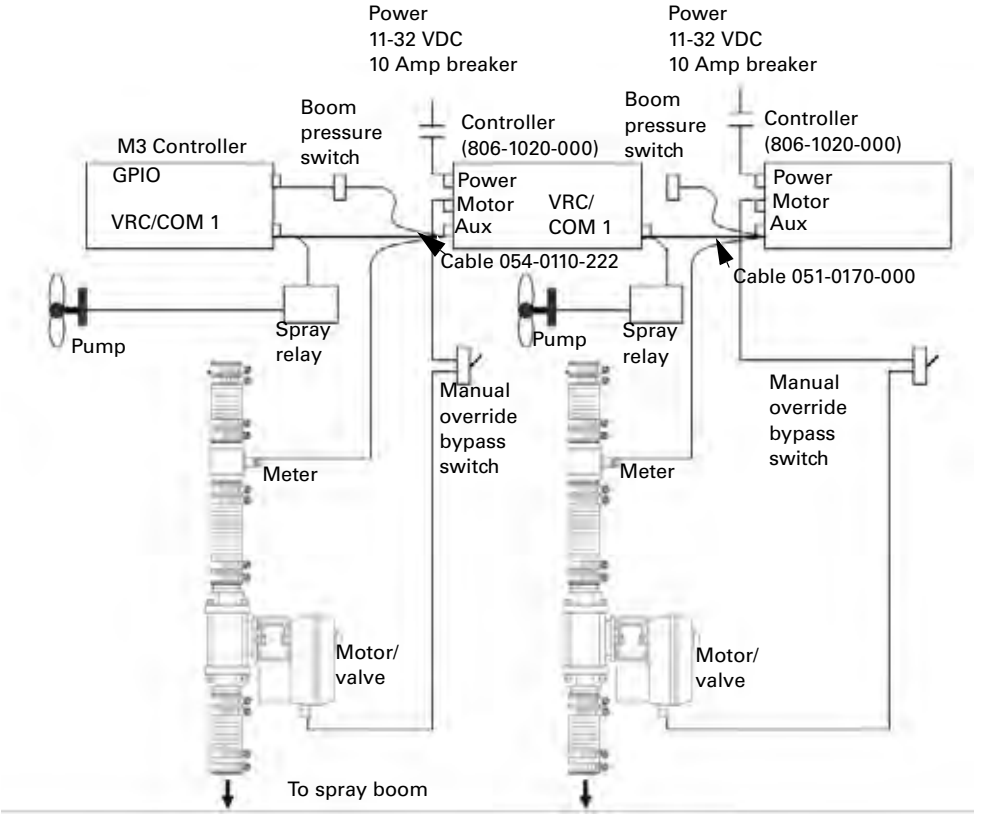


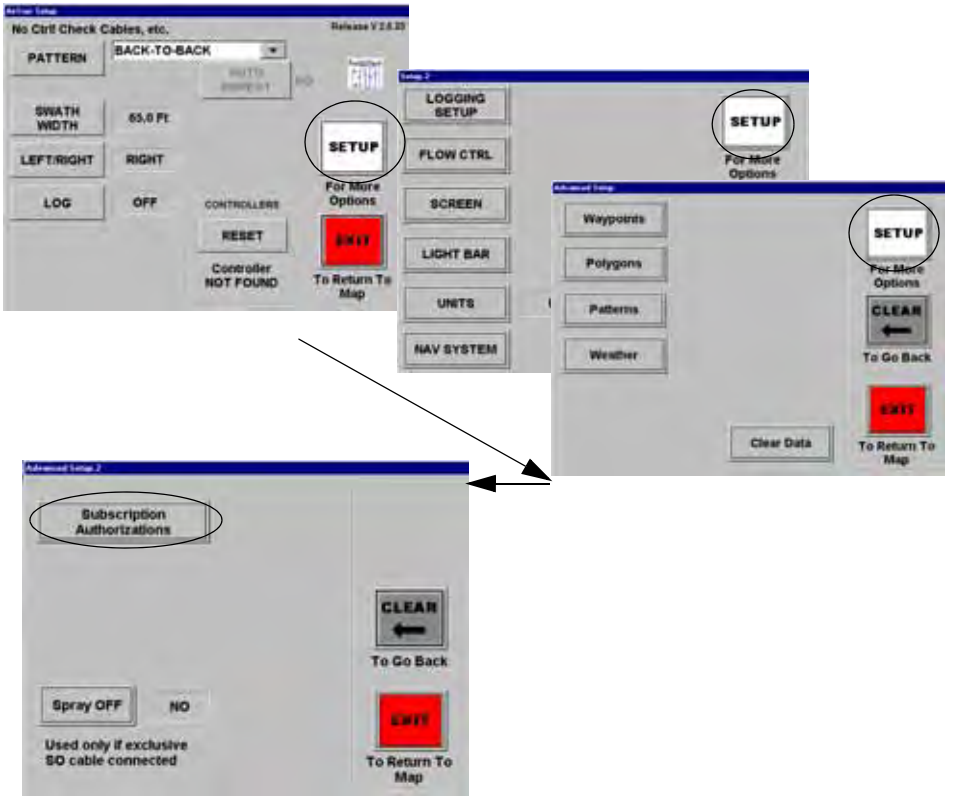
Figure 3-1: IntelliFlow Dual Rate cable connections.

Chapter 4: Activating Your Subscription (M3)

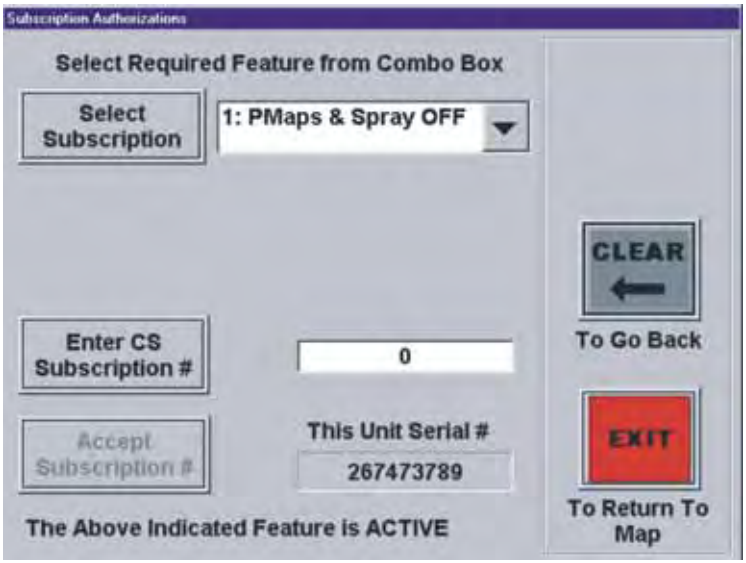
You must activate your subscription to access the variable rate and/or IntelliFlow Dual Rate options if using the M3. Without activating your subscription, you will only be able to fly single hopper, constant rate jobs.

To activate your subscription

1. Select **Setup > Setup > Setup > Subscription Authorizations** to access the **Subscription Authorizations** screen.

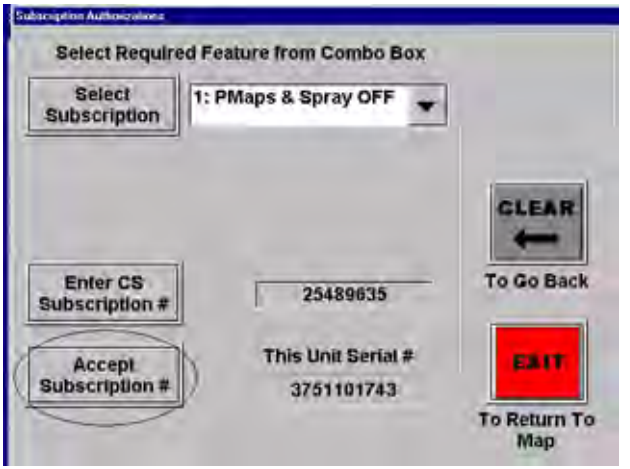


2. From the **Subscription Authorizations** screen, select the feature you want to activate and enter your subscription number.
   a. In the *Select Subscription* field, select the feature you are activating from the drop-down menu.
   b. In the *Enter CS Subscription #* field, enter your subscription number.



Note: If you did not receive a subscription number at your time of purchase, please call Hemisphere GPS Technical Support at 480-348-9919.

c. Verify that you entered the correct subscription number by selecting *Accept Subscription #*.



4. Repeat the above steps for each feature you wish to activate.

Chapter 5: Setting Flow Control Options

Setting IntelliFlow Options (M3)

Setting IntelliFlow Dual Rate Options (M3)

Setting IntelliFlow Options (Flying Flagman)

Setting IntelliFlow Options (M3)

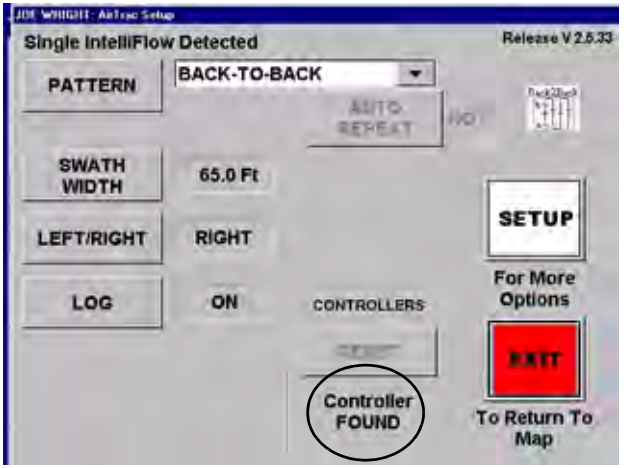
The AirTrac M3 automatically detects which supported flow control system is connected. If using IntelliFlow, a "Single IntelliFlow Detected" message appears at the top of your **AirTrac Setup** screen.

With IntelliFlow, you can fly either a constant or variable rate spray job. Variable rate spray jobs require you to upload a prescription map.

This section covers setting flow control options for constant rate or variable rate spray jobs.

To set the flow control options

1. Turn on the M3 system. The **AirTrac Setup** screen appears:



   The screen displays the following message indicating installation was successful: "Controller FOUND."

Note: If the "Controller NOT FOUND" message appears, click the RESET button to search for installed controllers.

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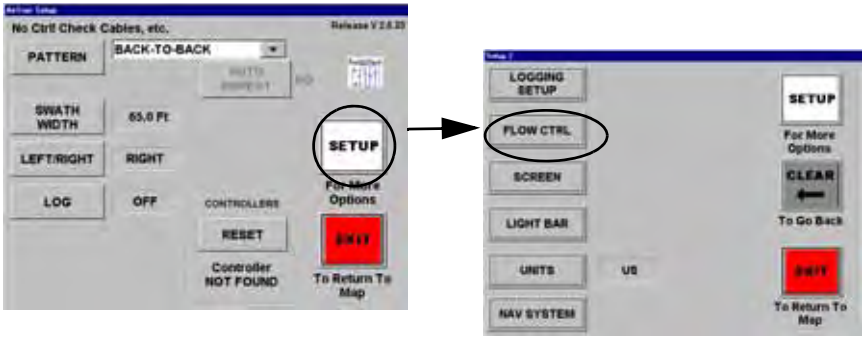
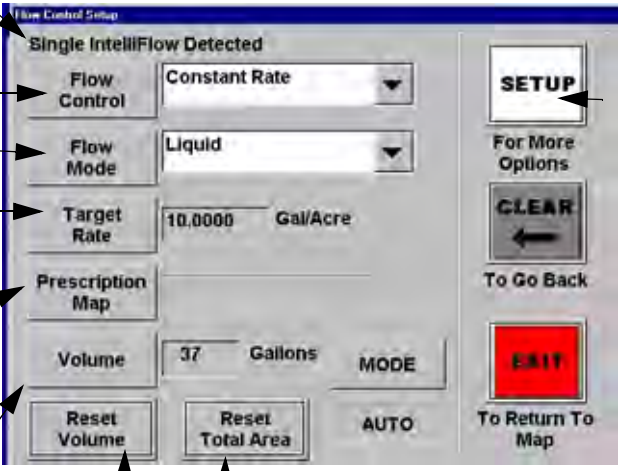
2. From the **AirTrac Setup** screen, select **SETUP > Flow Control** to access the **Flow Control Setup** screen.



3. From the **Flow Control Setup** screen, set your basic flow control options.



Controller type is automatically detected.

Select the type of spray job - constant or variable rate.

Select application type: liquid or dry.

Enter a target rate if flying a constant rate spray job.

Import Prescription Map if flying a variable rate spray job.

*Enter beginning volume

Reset volume when refilling hopper.

Reset total area when starting a new spray job.

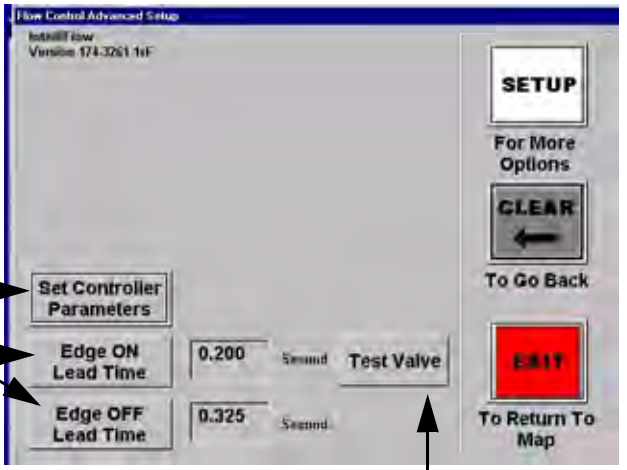
Select **Setup** to access the Advanced Flow Control Setup screen for:

- meter calibration

- flow lead time (on/off), and

- valve testing (see Appendix).

4. Select **Setup** to open the **Flow Control Advanced Setup** screen.

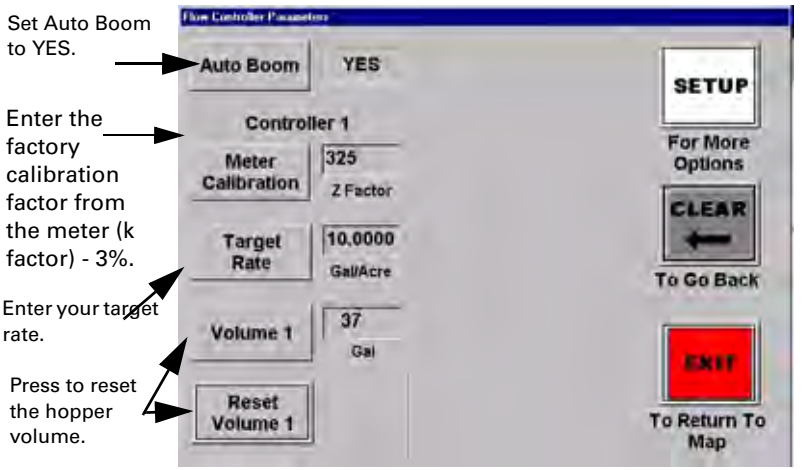


Select to set controller parameters.

Lead time represents how early the flow control will react to reach the proper rate at the proper location. Adjust defaults if necessary.

If you need to test your valve, see Troubleshooting.

5. Set the controller parameters from the **Flow Controller Parameters** screen.


Set Auto Boom to YES.
Enter the factory calibration factor from the meter (k factor) - 3%.
Enter your target rate.
Press to reset the hopper volume.
Auto Boom
YES
Controller 1
Meter Calibration
325
Z Factor
Target Rate
10.0000
Gal/Acre
Volume 1
37
Gal
Reset Volume 1
SETUP
For More Options
CLEAR
To Go Back
EXIT
To Return To Map

Setting IntelliFlow Dual Rate Options (M3)

The AirTrac M3 automatically detects which supported flow control system is connected. If using IntelliFlow Dual Rate, a “IntelliFlow Dual Rate Detected” message appears at the top of your **AirTrac Setup** screen.

With IntelliFlow Dual Rate, you can set job spray options for two different controllers - a primary controller and a secondary controller.

- The primary controller controls your primary hopper. The primary hopper allows you to set a constant target rate.
- The secondary controller controls the secondary hopper. The secondary hopper allows you to set a variable target rate using a prescription map.

The two-controller system allows you to fly a constant and variable rate spray job simultaneously. For example, perhaps you need to spray one rate for most of the field, but spray a different rate for certain areas. You can set your primary target rate using the primary controller and designate the areas needing heavier spraying by using a prescription map with the secondary controller.

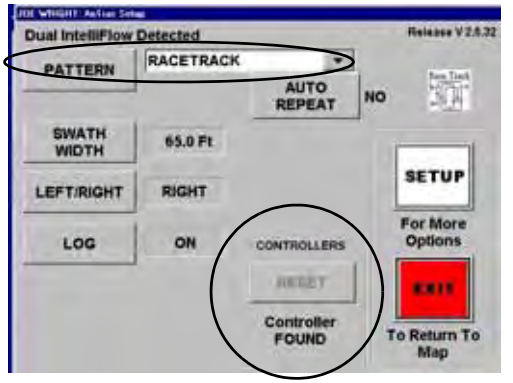
IntelliFlow Dual Rate also provides you with the flexibility to switch back to a single, constant or variable rate job by disabling the secondary hopper from the main flow control setup screen.

This section covers:

- Setting flow control options for dual controllers (constant and variable rate spray jobs)
- Disabling the secondary controller for single constant or variable rate jobs

To set flow control options for dual controllers (constant and variable rate)

1. Turn on the M3 system. The **AirTrac Setup** screen appears:



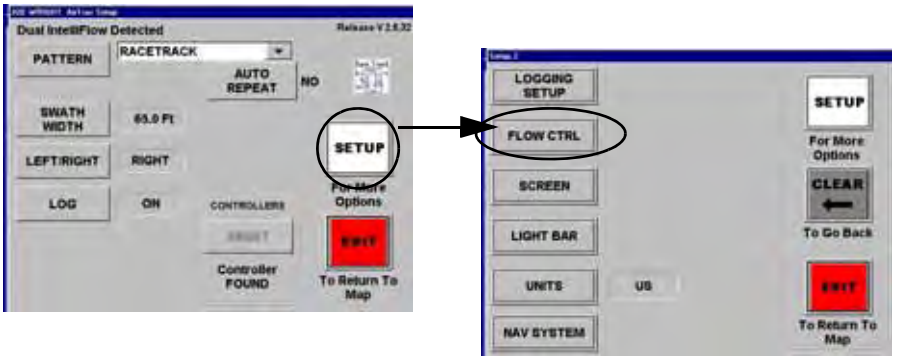
The screen displays the following messages indicating installation was successful:

- "IntelliFlow Dual Rate Detected" in the top left corner.
- "Controller FOUND" at the bottom of the screen.

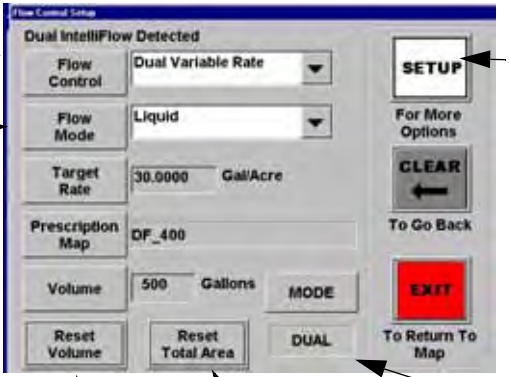
Note: If the "Controller FOUND" message does not appear, click the RESET button to search for installed controllers.

---

2. From the **AirTrac Setup** screen, select **SETUP > Flow Control** to access the **Flow Control Setup** screen.



3. From the **Flow Control Setup** screen, set your flow control options for the primary hopper.



Controller type is automatically detected.

Select application type: liquid or dry.

Enter a target rate for the primary hopper.

Import a Prescription Map for the secondary hopper. This will control your target rate.

Enter beginning volume for the primary hopper. Volume for the secondary hopper is set in the **IntelliFlow Dual Rate Controller Parameters** screen.

Select **Setup** > **Set Controller Parameters** to set controller parameters for the secondary hopper.

Reset volume for hopper 1 here. The reset volume button for the secondary hopper is in the **IntelliFlow Dual Rate Controller**

Reset Total Area when starting a new spray job.

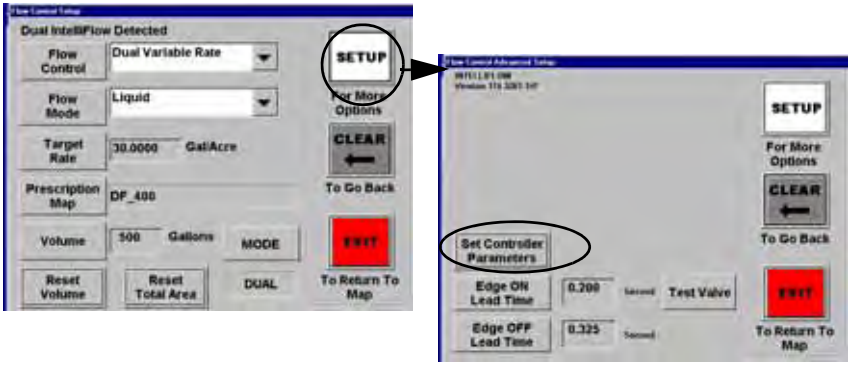
Set Mode to DUAL. SINGLE will disable the secondary controller.

Notes:

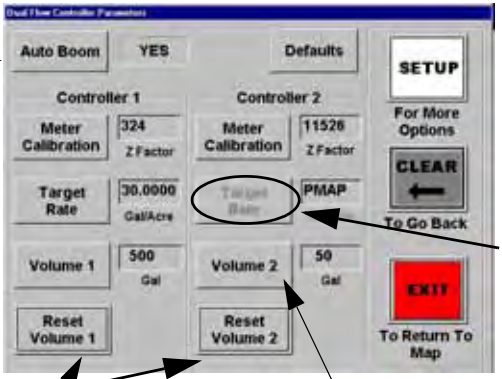
If using the IntelliFlow Dual Rate system, you **must** import the Prescription Map for the secondary controller here on the main **Flow Control Setup** screen.

In the *Mode* field, AUTO automatically searches for and finds the controller type you have connected (if supported). Selecting DUAL will speed up initialization. SINGLE will disable the secondary controller, so do not select this if flying a two-controller job.

4. Select **Setup** > **Set Controller Parameters** to access the **IntelliFlow Dual Rate Controller Parameters** screen.



5. Set the controller parameters for Controller 2 from the **IntelliFlow Dual Rate Controller Parameters** screen. Notice that each controller has its own set of spray options.



Set Auto Boom to YES for Dual Flow.

Enter the factory calibration factor from the meter (k factor) - 3%.

Notice the Target Rate button is grayed out for the secondary controller.

The secondary controller requires a prescription map. You cannot select a prescription map from this screen. you must return to the **Flow Control Setup** screen to import a prescription map.

Each hopper has its own Reset Volume button.

Set volume for hopper 2 here.

Warning! If, while using the secondary controller, the *Target Rate* field displays "N/A," you must return to the **Flow Control Setup** screen to import a prescription map.

Notice that the *Target Rate* button is grayed out for the secondary controller. You cannot select a prescription map from this screen. you must return to the **Flow Control Setup** screen to import a prescription map.

To set flow control options for a single controller (constant or variable rate)

1. Follow steps 1 - 3 in the previous section to set your flow control options for the primary hopper.
2. In the **Flow Control Setup** screen's *Mode* field, select SINGLE.

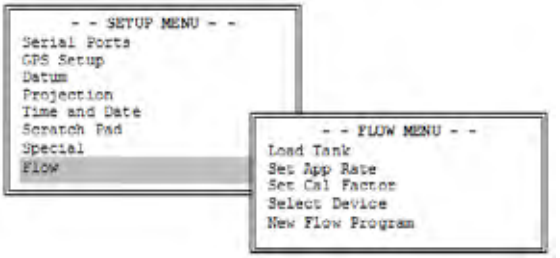
Setting IntelliFlow Options (Flying Flagman)

The Flying Flagman flow control options are set from the main **Flow Menu**. Before flying a spray job, you must set:

- the beginning hopper volume,
- the target spray rate, and optionally, the turnaround delay,
- the meter calibration factor, and
- IntelliFlow as the desired controller

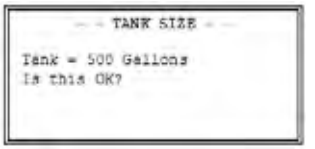
Warning! Before setting IntelliFlow Options for the Flying Flagman, you must select the desired units in the Scale menu.

1.Open the **Flow Menu**.



2.Enter the beginning hopper volume.

a. From the **Flow Menu**, select **Load Tank**. The TANK SIZE screen appears:

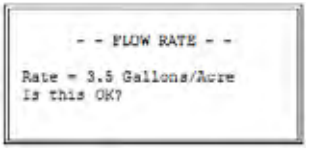


b. Press Enter to select, or the arrow key to enter a different number.

Note: The remaining volume amount is displayed on the Run screen by REM.

3. Enter your target flow rate.

   a. From the **Flow Menu**, select **Set App Rate**. The FLOW RATE screen appears:



   b. Press Enter to select, or the arrow key to enter a different number.

Note: The flow rate is displayed on the Run screen by APP or APPLICATION FLOW RATE

---

4. (Optional) Change the turnaround delay (TAD). The TAD is the additional reversal time (in milliseconds) given to the IntelliFlow motor when reversing direction. The default rate is 40 ms.

   a. To enter a turnaround delay, enter “0” for the rate in the FLOW RATE screen (step 3, above). The FLOW TAD screen appears:

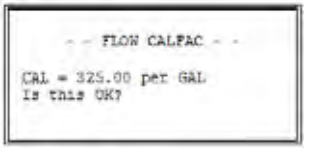
   b. Press Enter to select, or the arrow key to enter a different number.

Note: The TAD must be between 20 and 70 ms.

---

5. Set the calibration factor.

   a. From the **Flow Menu**, select **Set Cal Factor**. The FLOW CALFAC screen appears:



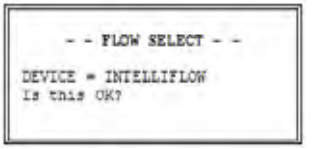
   b. Press Enter to select, or the arrow key to enter a different number.

Note: The calibration factor is the factory calibration number found on the meter minus 3%.

---

6. Select IntelliFlow as your controller.

   a. From the **Flow Menu**, select **Select Device**. The FLOW SELECT screen appears:



   b. Press Enter to select, or the arrow key if IntelliFlow is not the controller shown here.

Chapter 6: Troubleshooting

Common Issues
Testing the Valve

Common Issues

Common issues addressed in this section include:

- No Power When Initialize System
- Valve Does Not Open
- Meter Does Not Work
- Motor Does Not Rotate
- Flow Data Is Not Displayed on the Run Screen

For further help, call Hemisphere GPS Technical Support.

No Power When Initialize System

After turning on the power, wait 10 to 15 seconds for the IntelliFlow controller microprocessor to initialize. The microprocessor startup can be heard with a low beep if ambient noise is low.

If there is no power to the system:

1. Ensure that there is power to the IntelliFlow controller and controller fuse.
2. Check the fuse.

Warning! Disconnect the power source from IntelliFlow controller when checking the fuse.

   a. Remove the fuse from the IntelliFlow controller and inspect the fuse for signs of over-current

Note: Voltage sent to the Normal/bypass switch from the IntelliFlow controller does not pass through the 10 Amp fuse on the controller. This is a security feature in case the IntelliFlow controller malfunctions, allowing the control valve motor to rotate to the open position.

   b. Check for other fuse problems:

      - aircraft battery state (common problem)
      - aircraft-IntelliFlow cable installation

- aircraft-IntelliFlow grounding connections
- aircraft battery charging system (e.g., alternator, regulator, etc.)

3. Check all wiring connections and terminal strips

Warning! Avoid shorts to ground which will damage the IntelliFlow controller and/or motor controller. Check the IntelliFlow controller grounding cable and grounding lugs.

Valve Does Not Open

Perform a valve test (see *Testing the Valve* in this chapter). If you have power to the system, but the valve does not open:

1. Ensure that the override switch is in the normal position.
2. Ensure that the pressure switch is normally open and working properly.

Note: The valve will not move if the pressure switch is stuck in the closed position.

   a. Remove the Aux switch I/O connector plug, where the pressure switch connects, from the IntelliFlow controller.

   b. Reset the system and check for normal operation. Normal operation indicates a problem with the pressure switch.

Meter Does Not Work

If the valve works, but the meter still does not work, try the following.

1. Manually spin meter and check for the system response.
2. Verify that the pressure switch is triggered. The system will not respond to the meter if it is not triggered.
3. Check for the general working condition of the controller if a spare transducer is available.

   a. Connect the transducer sensor to the cable that is normally connected to the flow turbine unit.

b. Generate pulses by passing or tapping an iron object over the pick-up point of the sensor.

Note: These simulated pulses are not sufficient for accurate testing, but are sufficient for checking cables, IntelliFlow control unit I/O ports, interface between the IntelliFlow control unit and the M3, and general display operation. Adjust for 200 Hz square wave, amplitude close to 150 mv, 0 offset. If a simple function generator is available, connect it to the sensor connector to produce pulses.

Warning! Do not install fuses greater than 10 Amps for the IntelliFlow control unit. A greater fuse value will cause internal damage to the IntelliFlow control unit.

1. Check the system for gummed up components. Turbine blades and the valve stem are susceptible to problems if proper maintenance isn't performed.
2. Check that the motor, controller, sensor unit, and connector do not have water or chemicals inside.

Motor Does Not Rotate

1. Check the voltage across the flow control sensor contacts if the motor does not rotate. The voltage should be logic 5 VDC. If the voltage across the sensor is 0 VDC or less than 4 VDC, check the sensor cabling and/or sensor.
2. Disconnect pressure sensor connections if the operation step 3, above is normal.

    - Maintain power to the IntelliFlow control unit.
    - Observe the flow status/flow position.
    - Toggle NORMAL/BYPASS to bypass the position. The motor will fully open.

Flow Data Is Not Displayed on Run Screen

- (Flying Flagman) If the **DISPLAY, 7 Run Screen** is blank or the status does not change, it is most likely a defective IntelliFlow control unit or a serial port problem.
- (M3) If the Flow Control screen data is blank or incorrect, it is most likely due to incorrect setup. See Chapter 5 for further information.

Testing the Valve

The valve test procedures for both the M3 and the Flying Flagman are described in this section.

Testing the Valve (M3)

Perform the valve test directly from the M3 menu. You can test:

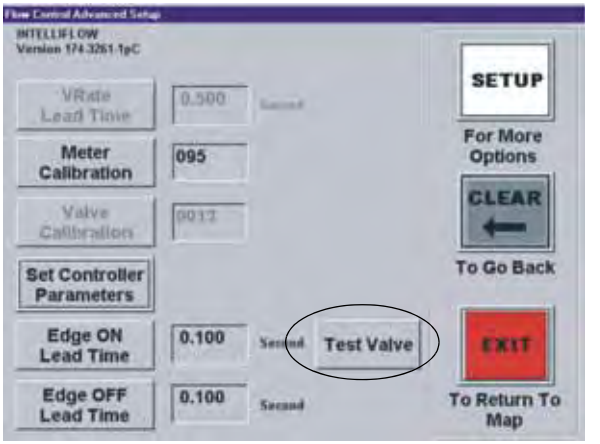
- if the valve opens and closes
- if the valve turnaround delay (TAD) is set correctly
- if the spray-off relay is working

Warning! When testing the valve, speed must be less than 11 m.p.h.

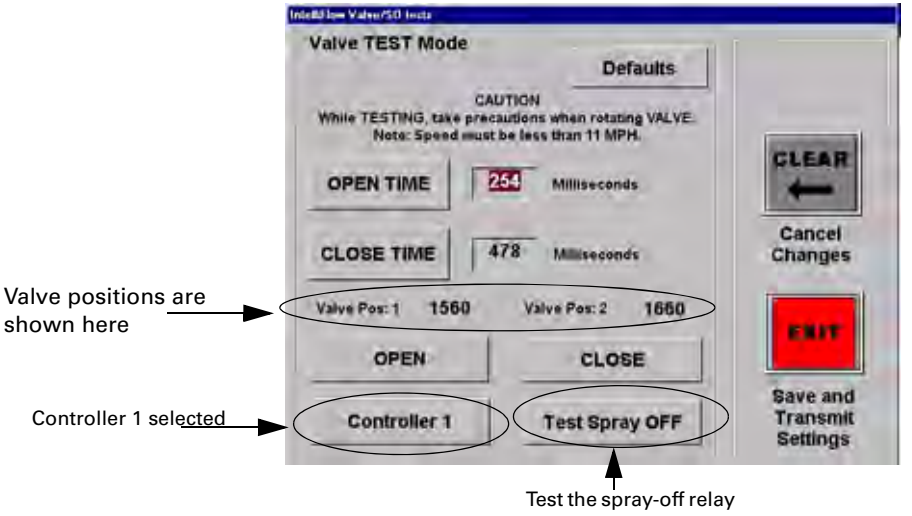
To test the valve

Note: If using IntelliFlow Dual Rate, you can test the valves and spray-off relays for the primary and secondary controllers independently. The controller you are testing will be displayed on the screen.

1. From the **Flow Control Advanced Setup** menu, select **Test Valve**.



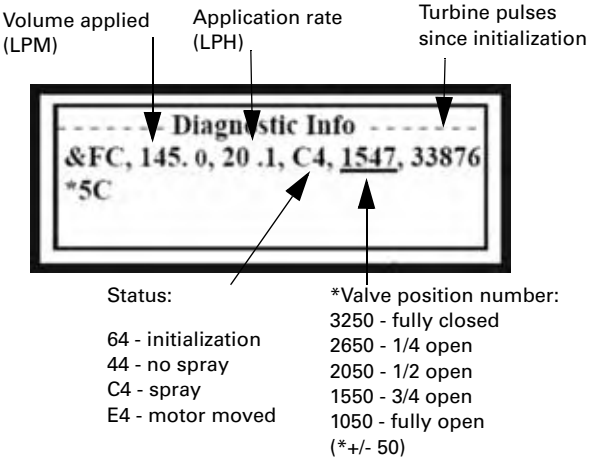
2. Select the valve open/close time in ms.



3. Press the Open and Close buttons. Notice the valve position numbers.
4. Test the spray-off relay, if necessary. The unit will stay active for 5 ms.

Testing the Valve (Flying Flagman)

1. Enter **Display, 7** to open the **Diagnostic Info** screen. Note the valve position number.



Note: The valve position values can change according to valve type and size.

2. Press the Run Screen key to exit this screen.

Chapter A: Appendix

Technical Specifications

Updating Firmware

Wiring Pin-Out Connections

Technical Specifications

Mechanical, power, and environmental specifications for the Hemisphere GPS IntelliFlow system and the optional IntelliFlow Dual Rate controller are provided below.

Table A-1: Mechanical Specifications - IntelliFlow

Item	Dimensions (in.)	Weight (lbs)
IntelliFlow Controller	11.7 L x 6.70 W x 2.38 H (29.7 L x 17.0 W x 6.03 H cm)	4.00 (1.8 kg)
Spray-Off Relay	6.00 L x 2.60 W x 1.63 H (4.1 H x 15.2 L x 6.6 W cm)	5.00 (2.3 kg)
Valve and Motor Assembly (2″)	5.50 L x 3.75 W x 10.00 H (25.4 H x 14.0 L x 9.5 W cm)	14.25 (6.5 kg)
Meter (2″)	4.75 L x 3.25 W x 4.75 H (12.1 H x 12. 1 L x 8.3 W cm)	4.00 (1.8 kg)
Cables	Not provided. Cable lengths vary.	3.50 (1.6 kg)

Table A-2: Mechanical Specifications - Optional IntelliFlow Dual Rate Controller

Item	Dimensions (inches)	Weight (lbs)
IntelliFlow Dual Rate Controller	11.70 L x 6.70 W x 2.38 H (29.7 L x 17.0 W x 6.0 H cm)	4.00 (1.8 kg)
Spray-Off Relay	6.00 L x 2.60 W x 1.63 H (15.2 L x 6.6 W x 4.1 H cm)	5.00 (2.3 kg)
Valve and Motor Assembly (2″)	5.50 L x 3.75 W x 10.00 H (12.7 L x 9.5 W x 25.4 H cm)	14.25 (6.5 kg)
Valve and Motor Assembly (1/2″)	4.00 L x 4.00 W x 7.00 H (10.2 L x 10.2 W x 17.8 H cm)	4.25 (1.9 kg)

Table A-2: Mechanical Specifications - Optional IntelliFlow Dual Rate Controller

Item	Dimensions (inches)	Weight (lbs)
Meter (2″)	4.75 L x 3.25 W x 4.75 H (12.1 L x 8.3 W x 12.1 H cm)	4.00 (1.8 kg)
Meter (3/4″)	4.00 L x 2.13 W x 3.75 H (12.1 L x 5.4 W x 9.5 H cm)	2.00 (0.9 kg)
Cables	Not provided. Cable lengths vary.	7.00 (3.2 kg)

Table A-3: Power Specifications - IntelliFlow Controller

Specification	Description
Inverse Voltage Protection	Yes
Over Current and/or Short Circuit Protection	Yes
Operating Voltage	24 - 36 VDC
Maximum Working Current	10 Amps
Maximum Transient Current	10 Amps
Nominal Operating Current Range	0.3 to 6 Amps

Table A-4: Power Specifications - Spray-Off Relay

Specification	Description
Inverse Voltage Protection	Yes
Over Current and/or Short Circuit Protection	Yes
Operating Voltage	11 - 60 VDC

Table A-4: Power Specifications - Spray-Off Relay

Maximum Working Current	7 Amps
Maximum Transient Current	10 Amps
Nominal Operating Current Range	0.1 to 6 Amps

Table A-5: Environmental Specifications

Operating Temperature	-4 to + 140 F (-20 to +60 C)
Storage Temperature	-40 to + 176 F (-40 to +80 C)
Humidity	95% non-condensing
Resistance	Dust and Water Vibration and Shock

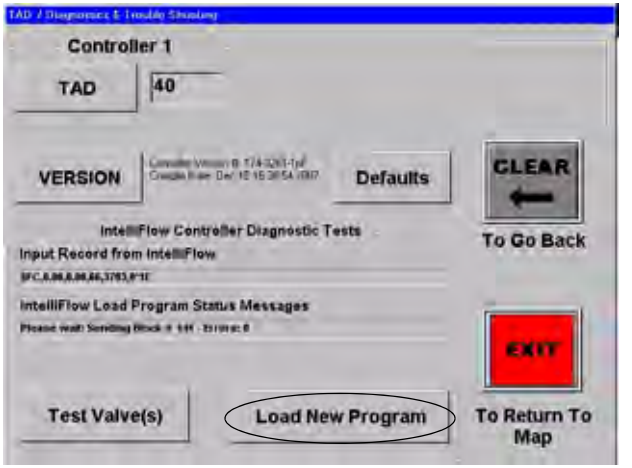
Updating Firmware

This section describes the procedure to update firmware for both the M3 and the Flying Flagman.

Updating Firmware (M3)

To update firmware from the M3

1. Copy the firmware update files to your PCMCIA card.
2. Place the PCMCIA card in the M3 controller.
3. Select **Load New Program** from the **TAD/Diagnostics & Troubleshooting** screen.



Note: GPS speed must be less than 5 m/s and the system must recognize the *software version for the **Load New Program** button to be selectable.

*The software version must be more recent than 1pF or 1rF.

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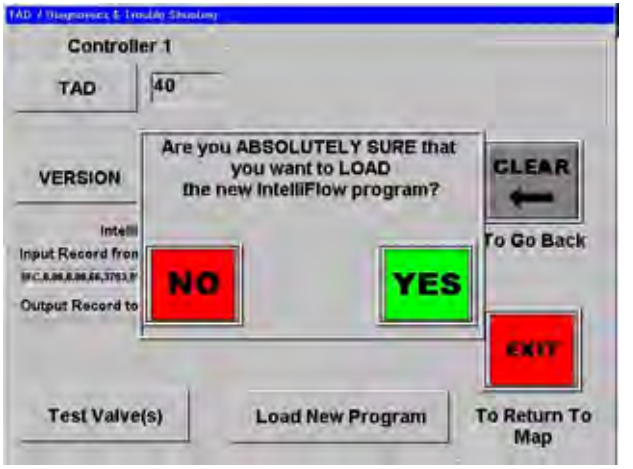
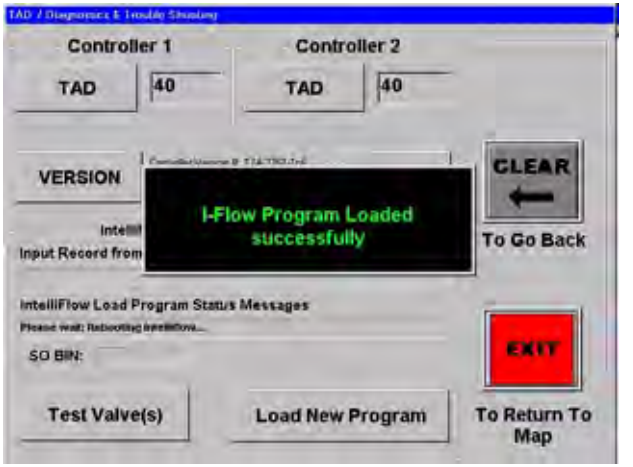
4. Select **YES** or **NO** to upload or cancel upload.



5. A status message displays, “Please Wait, Rebooting IntelliFlow.” The following screen then appears.



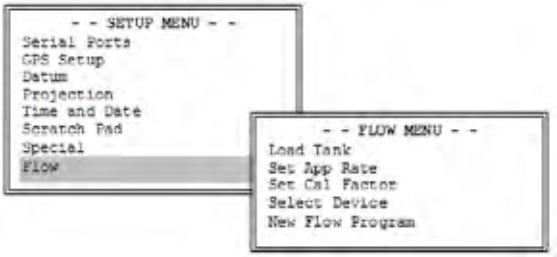
Updating Firmware (Flying Flagman)

To update firmware from the Flying Flagman

1. Copy the firmware update files to your PCMCIA card.

Warning! The PCMCIA card must be formatted properly (DOS). An incorrectly formatted card may corrupt your system and require you to use the cable download method to restore your files.

2. Place the PCMCIA card in the Flying Flagman controller.
3. From the main **Setup** menu, select **Flow** > **New Flow Program**.

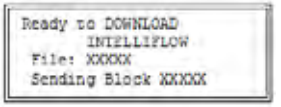


4. Press **Enter** to abort the download process or wait to see the next screen.

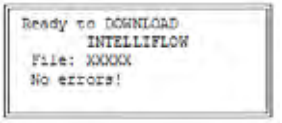
5. To download the new software from the PCMCIA card, please note that if the red LED light on the upper right corner of the shift key is illuminated, you press the **Shift** key twice and then press the **Esc** key.

   If the red LED light on the upper right corner of the shift key is not illuminated, you press the **Shift** key once and then press the **Esc** key. The keys must be press sequentially, not simultaneously, to initiate the download process.

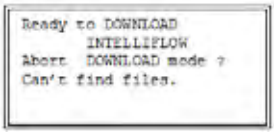
6. Wait while the system downloads the IntelliFlow update.



7. Verify that the update was successful. If so, the following screen appears:



If not, the following error screen appears:



8. Reboot your system for the update to take effect.

Wiring Pin-Out Connections

This section provides additional detail for cable wiring pin-out connections.

- Cable 051-0163-222 (IntelliFlow - Spray-Off Relay, AUX, M3, and Flow Meter)
- Cable 054-0110-222 (IntelliFlow - Motor/Valve)
- Cable 051-0170-000 (IntelliFlow Dual Rate - Spray-Off Relay, AUX, M3, and Flow Meter)
- Cable 051-0204-222 (Flying Flagman GMU)
- Cable 051-0173-000 (IntelliFlow Dual Rate - Ultra Low Volume Adapter)

Cable 051-0163-222 (IntelliFlow - Spray-Off Relay, AUX, M3)

Connection diagram for the IntelliFlow, Spray-Off Relay, AUX, M3 and DNTI flow meter.

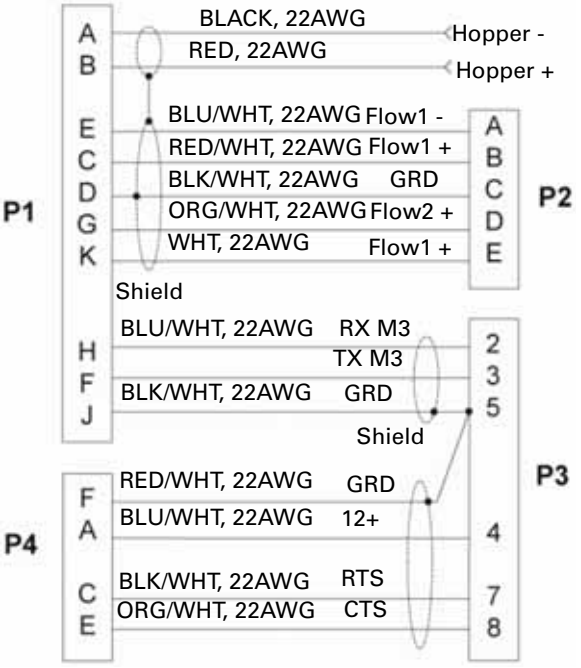


Figure A-1: Cable 051-163-222 wiring pin-out connections.

Cable 054-0110-222 (IntelliFlow - Motor/Valve)

The wiring pin-out connections for the boom pressure switch (SW1) are shown below.

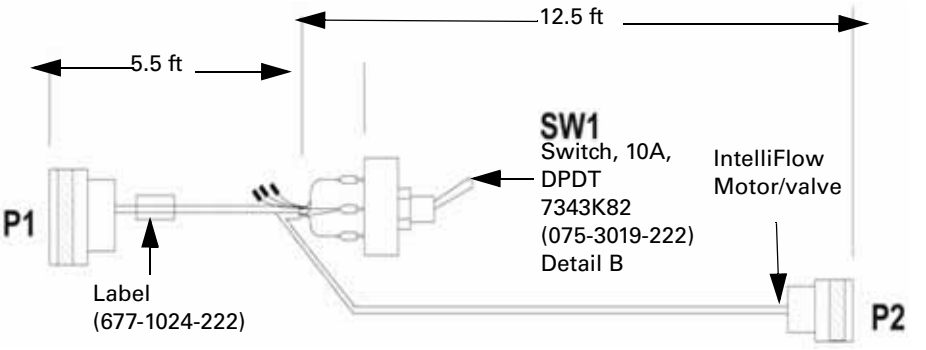


Figure A-2: Cable 054-0110-222.

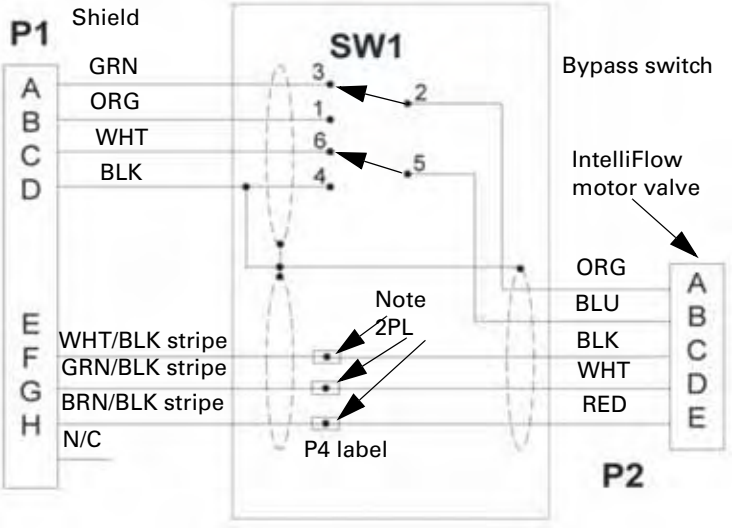


Figure A-3: Wiring pin-out details for SW1.

Cable 051-0170-000 (IntelliFlow Dual Rate - Spray-Off Relay, AUX, M3, and Flow Meter)

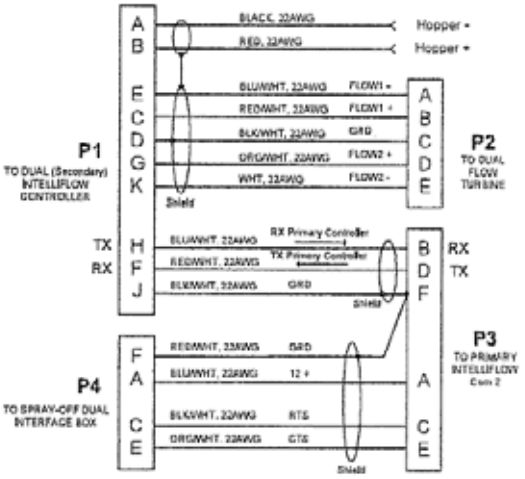


Figure A-4: Cable 051-0170-000 pin-out connections.

Cable 051-0204-222 (Flying Flagman GMU AUX Switch Connections)

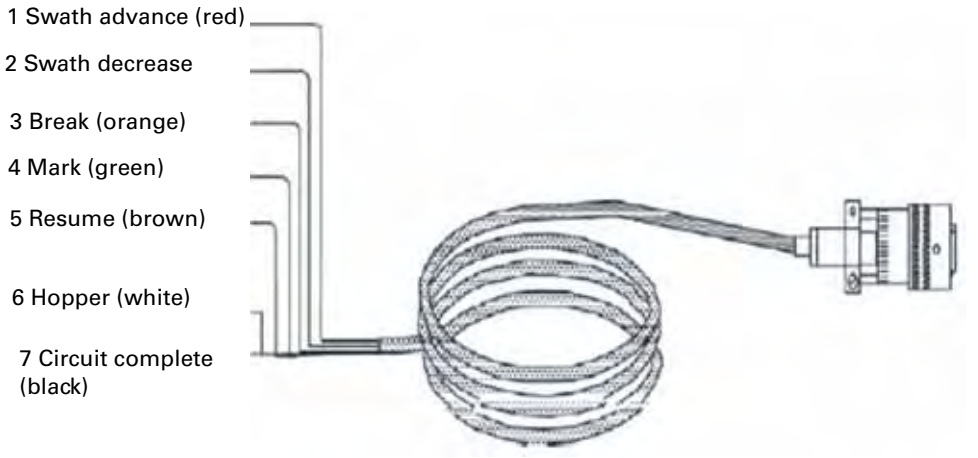


Figure A-5: GMU-1/TNG AUX switch connections.

Warning! DO NOT connect the black ground wire to the aircraft ground or shield of the cable.

DO NOT allow the black ground wire to touch any part of the fuselage.

The black ground wire is the logic return ground for the GMU's remote switch functions. The black ground wire is used as the common return for the other remote switch wires.

See the following figure for an example.

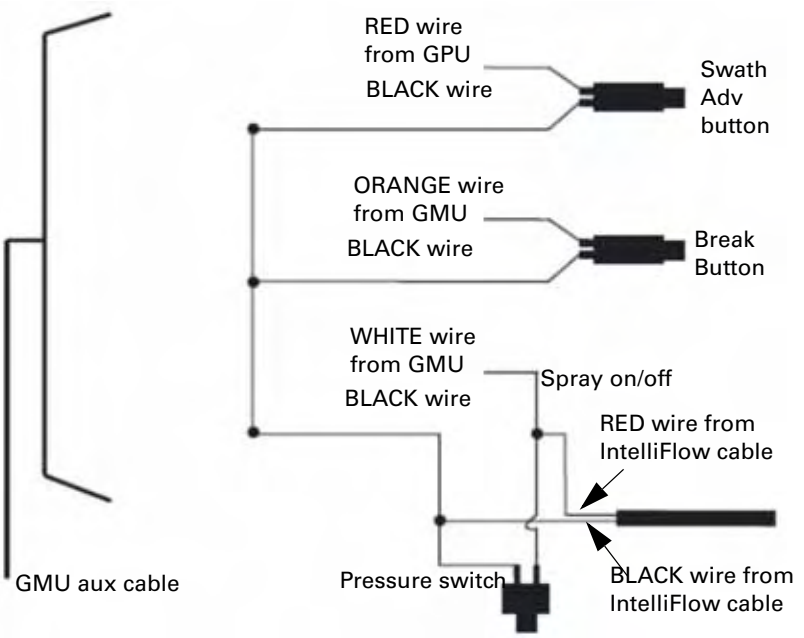


Figure A-6: GMU AUX switch connection example.

Cable 051-0173-000 (Ultra-Low Volume Adapter)

Figure A-7: Cable 051-0173-000.

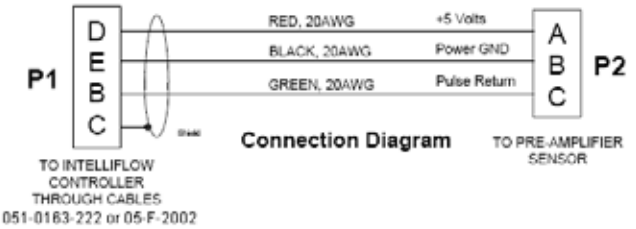


Figure A-8: Cable 051-0173-000 wiring pin-out connections.

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